

# Pedestrian and Hypothermia Deaths Among Native Americans in New Mexico Between Bar and Home

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**Objective.**—To determine the nature of excess injury mortality among Native Americans in New Mexico.

**Design.**—Retrospective review of death certificates for deaths from unintentional injuries.

**Setting.**—The state of New Mexico.

**Subjects.**—New Mexico residents who died of unintentional injuries between January 1, 1980, and December 31, 1989.

**Main Outcome Measure.**—Cause-specific mortality rates.

**Results.**—Over half of the excess mortality from all unintentional injuries among Native Americans resulted from hypothermia and from pedestrian-motor vehicle crashes. New Mexico Native Americans were nearly eight times more likely to die in pedestrian-motor vehicle crashes and were 30 times more likely to die of hypothermia compared with other New Mexico residents. At death, 90% of those Native Americans tested were highly intoxicated (median blood alcohol concentrations of 0.24 and 0.18 mg/dL for pedestrian and hypothermia deaths, respectively). Despite the fact that most Native Americans in New Mexico live on reservations, most deaths occurred at off-reservation sites in border towns and on roads leading back to the reservation.

**Conclusions.**—The possession and sale of alcohol is illegal on many Native American reservations. This policy forces Native Americans who want to drink to travel long distances to obtain alcohol. These data suggest that this policy is also the likely explanation for the markedly increased risk of death from hypothermia and pedestrian-motor vehicle crashes in this population.

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WHILE Native Americans are less likely than other Americans to die of heart disease, cancer, stroke, and chronic obstructive pulmonary disease, their mortality rate from unintentional

injuries is more than double the corresponding rates for the United States as a whole.<sup>1</sup> Unintentional and intentional injuries are the leading cause of death

For editorial comment see p 1384.

for Native Americans, and injuries are second only to "deliveries and complications of pregnancy and the puerperium" as a cause of hospitalization within Indian Health Service hospitals.<sup>2</sup>

Approximately 123 000 Native Americans live in New Mexico. One quarter

of all deaths in this population between 1980 and 1989 were the result of unintentional injuries. To determine more precisely the nature of this excess mortality and to discover potential avenues for prevention, we conducted a retrospective review of all deaths from unintentional injuries in New Mexico from 1980 through 1989.

## METHODS

Information on all deaths from unintentional injuries among New Mexico residents that occurred between 1980 and 1989 was obtained from the death certificates on file with the Office of Vital Records and Statistics, New Mexico Department of Health. The death certificate contains information on the cause of death, coded according to the *International Classification of Diseases, Ninth Revision*, external cause of injury code.<sup>3</sup> Deaths attributed to "accidents and other external causes" had codes of E-800 to E-999. Persons who died as a result of being struck by a motor vehicle had a code of E-814.7, while persons who died from hypothermia had a code on the death certificate of E-901.0 (excessive cold due to weather conditions), E-904.0 (hunger, thirst, exposure, or neglect of infants and helpless persons), or E-904.3 (exposure to weather conditions not specified elsewhere). Only New Mexico residents, as indicated on the death certificate, were included in the analysis; those death certificates with unknown race or age were excluded. Race was assigned by the Office of Vital Records and Statistics based on information contained on the death certificate (a previous study<sup>4</sup> has

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Reprint requests to Office of Epidemiology, New Mexico Department of Health, PO Box 26110, 1190 St Francis Dr, Santa Fe, NM 87502 (Dr Gallaher).

Type of Injury	Native Americans		Other NM Residents		RR	95% CI
	No. of Deaths (1980-1989)	Average Annual Age-Adjusted Mortality Rate	No. of Deaths (1980-1989)	Average Annual Age-Adjusted Mortality Rate		
All unintentional injuries	1585	153.90	7145	50.04	3.1	2.6-3.6
Motor vehicle occupants	668	61.44	3359	25.33	2.4	1.9-3.1
Pedestrian struck by motor vehicle	347	34.69	631	4.57	7.5	5.3-10.6
Hypothermia	166	20.06	101	0.66	30.5	17.7-48.7
Drowning	95	7.54	360	2.71	2.8	1.3-5.1
Fall	77	8.13	908	4.47	1.8	0.8-3.6
Poisoning	37	3.30	297	2.18	1.5	0.4-3.9
Burn	33	3.33	210	1.46	2.3	0.5-6.7
All other injuries	162	15.41	1279	8.66	1.8	1.0-2.9

\*The 1985 population estimate was used to calculate mortality rates. NM indicates New Mexico; RR, relative risk; and CI, confidence interval.

validated the coding of race on death certificates in this state).

For the two causes of death (pedestrian and hypothermia) for which Native Americans had markedly elevated mortality rates compared with other New Mexicans, medical examiner reports were obtained from the Office of the Medical Investigator (OMI). These reports contain a narrative description of the circumstances surrounding the death, blood alcohol levels, and toxicology results. All injury deaths are investigated by the OMI. Deaths on federal reservations (military or Indian) are not within the jurisdiction of the OMI; however, the OMI may investigate the death if invited to do so. Most Native American injury deaths that occur in the state are investigated by the OMI.

The location of the Native American pedestrian deaths were obtained from the crash report files maintained at the New Mexico Traffic Safety Bureau. The methods used by this bureau to obtain a roster of traffic fatalities in the state have been described elsewhere.<sup>5</sup> Briefly, the Traffic Safety Bureau receives police reports of all crashes on public roads that involve a fatality, injury, or at least \$250 in property damage.

Population denominators were derived from the Office of Vital Records and Statistics and are based on extrapolations from the 1980 census.<sup>6</sup> Average annual rates of injury deaths were calculated by averaging the annual number of deaths for the 10-year study period and dividing that figure by the mid-year (1985) population estimate. Age-adjusted rates of injury deaths were calculated by the direct method<sup>7</sup> and were standardized to the 1940 US population.<sup>8</sup>

Analyses were done using the Epi Info version 5 software package (USD Inc, Stone Mountain, Ga).<sup>9</sup> The 95% confidence intervals for the relative risks (RRs) were calculated according to the methods described by Bailar and Ederer.<sup>10</sup>

## RESULTS

From 1980 through 1989, there were 1585 Native Americans (153.9 per 100 000 population per year) and 7145 other residents (50.0 per 100 000 population per year) in New Mexico who died of unintentional injuries. Age-adjusted mortality rates for Native Americans exceeded mortality rates for other New Mexico residents in all subgroups of unintentional injury deaths (Table).

For most categories, the age-adjusted RR of death for Native Americans compared with other New Mexicans was less than 3. For two categories, pedestrian deaths and deaths from hypothermia, the RR for Native Americans was dramatically elevated. Compared with other residents of New Mexico, Native Americans were nearly eight times more likely to die in pedestrian-motor vehicle crashes and were 30 times more likely to die of hypothermia. The 513 Native Americans who died in pedestrian-motor vehicle collisions or from hypothermia accounted for 8% of all Native American deaths in the state during the study period. More than half (53%) of the excess mortality from all unintentional injuries in Native Americans resulted from these two causes alone.

Of the 347 Native American pedestrian deaths, 264 (76%) were male. Of the 166 Native American hypothermia deaths, 142 (86%) were male. The age-specific rates of pedestrian and hypothermia deaths for Native Americans compared with all other New Mexico residents are shown in Fig 1. For all age groups, Native Americans had a higher pedestrian and hypothermia death rate than other New Mexicans, but the RR was greatest for those older than 14 years.

Medical examiner reports were available for 298 (86%) of the pedestrian deaths and 145 (87%) of the hypothermia deaths. Of the 70 deaths for which

there was no medical examiner report, 50 (71%) occurred on reservation sites. Blood alcohol concentration results were available for 252 (80%) of the 316 Native American pedestrian deaths and 134 (82%) of the 164 hypothermia deaths involving victims older than 14 years. Of those tested, alcohol was present in 229 (91%) of the pedestrians, with a median blood alcohol concentration of 0.24 mg/dL (range, 0.10 to 0.71 mg/dL). Similarly, alcohol was present in 120 (90%) of those who died of hypothermia and were tested, with a median blood alcohol concentration of 0.18 mg/dL (range, 0.03 to 0.56 mg/dL).

Information was available to identify the location of death for 387 (81%) of the 480 pedestrian and hypothermia deaths involving Native Americans older than 14 years. Of these, 385 (99%) occurred in the northwest quadrant of the state (Fig 2). Although most Native Americans in New Mexico live on reservations, 67% of the Native American pedestrian and hypothermia deaths occurred outside the reservation borders. Specifically, the deaths clustered in two major off-reservation cities and on the roads leading from these two cities back to the reservation (clusters A and B in Fig 2). Other geographic clusters of pedestrian and hypothermia deaths are seen in areas around reservations in other areas of the state (Fig 2, clusters C, D, E, and F).

## COMMENT

Native Americans are at an especially high risk for both hypothermia and pedestrian deaths in New Mexico. These two seemingly disparate categories of death are linked by a common high-risk profile—a highly intoxicated male who dies off-reservation while traveling on foot.

The association between alcohol intoxication and death from hypothermia has been documented.<sup>11-16</sup> Alcohol has both physiological and psychological ef-



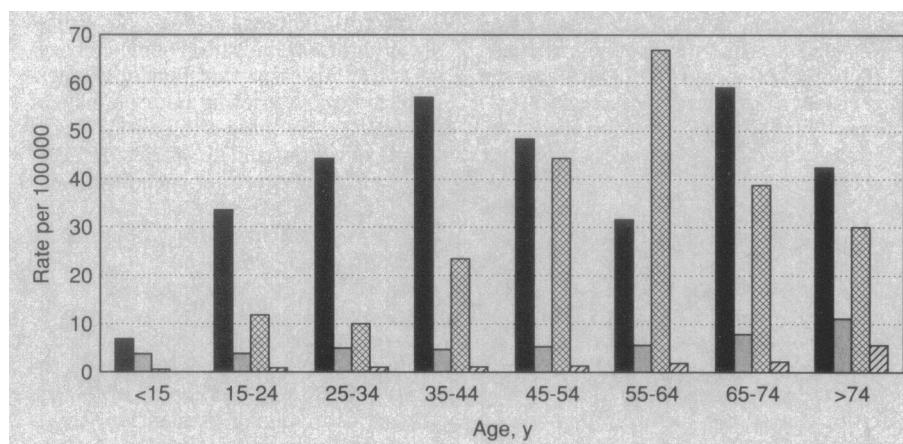


Fig 1.—Average annual age-specific mortality rates for pedestrians struck by a motor vehicle or persons who died of hypothermia for New Mexico Native Americans (NA) and other New Mexico (NM) residents, 1980 through 1989. The 1985 population estimate was used to calculate mortality rates. Solid bars indicate NA pedestrians; shaded bars, NM pedestrians; cross-hatched bars, NA hypothermia; and hatched bars, NM hypothermia.

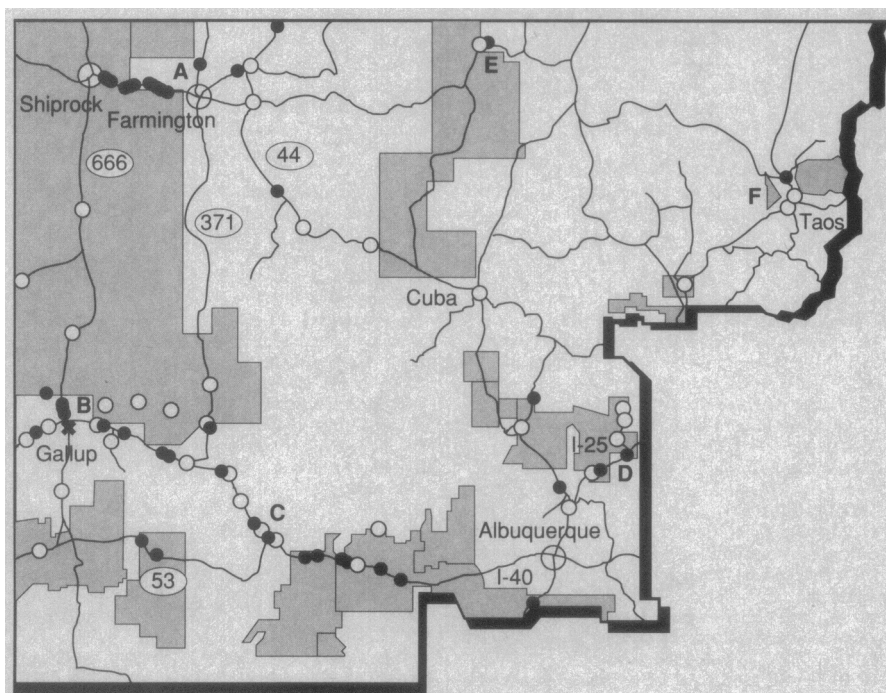


Fig 2.—Map of the northwest quadrant of New Mexico indicating the location of Native American pedestrian and hypothermia deaths for persons older than 14 years, 1980 through 1989. (Not shown are four deaths that occurred in the southern part of New Mexico.) Shaded areas indicate Native American reservations; solid circles, one death; smaller open circles, two through 10 deaths; larger open circles, 11 through 30 deaths; and bold x, more than 100 deaths.

fects, such as peripheral vascular dilation and impaired judgment, that increase a person's likelihood of death from exposure to cold temperatures. In pedestrian-motor vehicle collisions, alcohol may contribute to high death rates

by impairing the victim,<sup>17,18</sup> the motor vehicle driver,<sup>19</sup> or both.

The Navaho nation is unique in being the largest Indian reservation in land area and having the largest population of any tribe in the United States (about

one in six Native Americans are Navaho). However, it is typical of many Native American communities in terms of its high rates of unemployment, poverty, injuries, and alcohol-related problems.<sup>20</sup> A major reason that many Native Americans travel to drink alcohol is that possession and sale of alcohol has been prohibited by statute for many years in many Native American communities. In the contiguous 48 states, the sale of alcoholic beverages is legal on only 91 (31%) of the 293 reservations.<sup>21</sup> Of the 25 Native American reservations in New Mexico, only seven (28%) permit possession and/or sale of alcohol.<sup>21</sup> The Navaho reservation, where approximately 60% of the Native Americans in New Mexico reside, does not permit the possession or sale of alcohol.

Federally imposed prohibition existed on the Navaho reservation through 1952; tribally imposed prohibition has been in effect since 1953.<sup>22</sup> In towns bordering the reservation, extraordinarily heavy drinking by some reservation residents has become commonplace. Miles from their own homes, intoxicated persons have limited options—they can attempt the hazardous journey back to their homes at night when the bars close or wait until morning to return to the reservation. The first option puts unprotected pedestrians trying to hitch a ride back to the reservation on unlit roads filled with intoxicated drivers. The second option places them at the mercy of winter in New Mexico, when nighttime temperatures often drop below  $-12^{\circ}\text{C}$ .

Those who favor legalization of alcohol sales on the reservation argue that prohibition not only contributes to the high rates of pedestrian and hypothermia deaths but also leads to rapid and forced drinking styles; encourages antisocial behavior; leads to bootlegging and corruption of officials; prevents young people from learning controlled patterns of drinking; leads to many more persons driving while intoxicated; and, in towns that border the reservation, contributes to high rates of arrest for public drunkenness, disorderly conduct, and assault. Yet a survey of adult Navaho residents found that 81% opposed legalization of the sale of alcohol on the reservation.<sup>22</sup> In addition to strongly held moral convictions against the sale of alcohol, many persons believe that prohibition reduces the overall prevalence of alcohol abuse. This was seen during the prohibition period in the United States (1920s and 1930s), when per capita consumption of alcohol was reduced to its lowest level in US history.<sup>23</sup> Many people also fear that the repeal of prohibition on reservations,

while possibly lowering injury deaths, would simultaneously produce higher rates of interpersonal violence, fetal alcohol syndrome, cirrhosis, and other chronic effects of alcohol abuse.

Actual field studies evaluating the impact of major changes in alcohol policies within Native American communities are rare. Banning alcohol sales in three communities in northwest Canada led to a decline in arrests for assault and public drunkenness (but not drunk driving) only in the most geographically isolated community.<sup>24</sup> A comparative study in 1976 of seven reservations in Montana and Wyoming, three of which had legalized alcohol before 1955 and the others remaining prohibitionist, found lower mortality rates from cirrhosis, motor vehicle crashes, suicide, and homicide among the reservations that permitted alcohol.<sup>25</sup>

Our study has several limitations to be addressed by future research. First, death certificate review is unable to address morbidity associated with these

injuries. Second, using other New Mexicans as a control group does not completely control for potential confounders, such as the rural setting and accessibility to emergency health care in the reservation and perireservation regions. Third, the design of the study did not allow an assessment of risk factors for the relatively small number of Native Americans who die of hypothermia and pedestrian-motor vehicle crashes compared with all Native Americans who engage in off-reservation drinking. Nonetheless, the strength of these findings demands urgent action.

The debate over the merits of prohibition is likely to continue indefinitely. In the meantime, several immediate strategies could reduce pedestrian and hypothermia deaths in this population. These strategies include (1) establishment of a van service to patrol the roadways between the reservation and bordering towns and to transport individuals to their homes; (2) establishment of a protective shelter to house intoxicated

persons and to provide rehabilitation; (3) distribution of reflector patches for clothing to increase pedestrian visibility at night; (4) limitation of alcohol consumption in towns that border the reservation by restricting hours of sale of alcohol and banning the sale of cheap fortified wines; and (5) strict enforcement of laws regarding speeding, driving under the influence of alcohol, and selling alcohol to intoxicated persons (a dramshop act).

Unfortunately, reducing alcohol-related morbidity and mortality among Native Americans is not as simple as repealing prohibition but instead will require a combination of community-wide strategies involving prevention, treatment, and rehabilitation.<sup>25-28</sup>

We wish to thank Sarah Morley at the Lovelace Medical Library, Marsha Starr and Ross Zumwalt, MD, of the Office of the Medical Investigator, and Patricia Totkamachi and Tony Ortiz of the Bureau of Vital Records and Statistics, New Mexico Health and Environment Department, for their assistance in conducting this study.

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to spouses or any other third party without the consent of the patient."

What happens in the case of a competent elderly woman who is being battered? State laws mandate reporting of elder abuse, regardless of the competency of the abused elderly person. Perhaps investigators need to explore the impact of mandatory reporting of abuse of competent elderly people. If this reporting contributes to the safety of competent older people or facilitates their access to appropriate resources, then why should mandatory reporting of domestic violence not provide the same benefits to younger women? If health services research demonstrates that competent older people are not being benefited, then perhaps mandatory reporting of suspected elder abuse and neglect should apply only to incompetent elderly people.

The Council on Ethical and Judicial Affairs needs to weigh the data that support mandatory reporting of abuse of competent older people before condemning mandatory reporting of abuse of competent, albeit younger, women.

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1. Council on Ethical and Judicial Affairs, American Medical Association. Physicians and domestic violence: ethical considerations. *JAMA*. 1992;267:3190-3193.

**In Reply.**—In developing its guidelines on domestic violence, the Council on Ethical and Judicial Affairs considered the experience with mandatory reporting in the context of elder abuse. A number of experts oppose mandatory reporting for elder abuse. They observe that it can deter elder adults from seeking medical care and other necessary assistance. In addition, because states often do not provide sufficient funding for meaningful interventions, mandatory reporting may increase the risk of harm without offering any countervailing benefit.<sup>1</sup> As discussed by the Council in its report,<sup>2</sup> similar concerns apply when mentally competent, non-elder adults are abused by their spouses or other intimate partners.

The Council also emphasized the importance of respecting the abused person's decision whether to accept an offered intervention or not. The Council Report recommends that physicians give assurances of safety and confidentiality and encourage their abused patients to consent to helpful interventions. Ultimately, however, the decision should rest with the patient. Forcing interventions on an unwilling patient not only overrides the patient's autonomy, it also exacerbates the disempowerment that victims of domestic abuse suffer. Rather than have mandatory reporting, the Council concluded that it would be more productive to increase funding for shelters, safe homes, and other resources for victims of domestic violence.

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American Medical Association  
Chicago, Ill

1. Brewer RA, Jones JS. Reporting elder abuse: limitations of statutes. *Ann Emerg Med*. 1989;18:1217-1221.

2. Council on Ethical and Judicial Affairs, American Medical Association. Physicians and domestic violence: ethical considerations. *JAMA*. 1992;267:3190-3193.

## Environmental Tobacco Smoke and Heart Disease: A Correction

Readers have raised questions concerning the absence of any financial disclosure following the Letter to the Editor from Dr Domingo Aviado.<sup>1</sup> In response, Dr Aviado would like us to publish the following "clarification statement":

"Atmospheric Health Sciences is an independent consulting firm for governmental agencies here and abroad, the tobacco industry, pharmaceutical industry, and petrochemical companies. However, Dr Aviado did not receive any form of compensation for writing the unsolicited Letter to the Editor on environmental tobacco smoke and heart disease."

The editors would point out that on February 16, 1992, Dr Aviado signed the following Financial Disclosure statement without noting any conflicts:

"I certify that any affiliations with or involvement in any organization or entity with a direct financial interest in the subject matter or materials discussed in the manuscript (eg, employment, consultancies, stock ownership, honoraria, expert testimony) are noted below. Otherwise, my signature indicates that I have no such financial interest. All financial research or project support is identified in an acknowledgment in the manuscript."

It seems clear to the editors that the two statements above cannot easily be reconciled and that Dr Aviado had a financial conflict of interest that should have been disclosed to our readers.

Drummond Rennie, MD  
Bruce B. Dan, MD

1. Aviado DM. Environmental tobacco smoke and heart disease. *JAMA*. 1992;267:3284-3285.

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## CORRECTION

**Incorrect Units of Measurement.**—In the article entitled "Pedestrian and Hypothermia Deaths Among Native Americans in New Mexico: Between Bar and Home," published in the March 11, 1992, issue of *THE JOURNAL* (1992;267:1345-1348), the units of measurement for blood alcohol concentrations reported are incorrect. On page 1345 in the "Results" section of the abstract, the third sentence should read as follows: "At death, 90% of those Native Americans tested were highly intoxicated (median blood alcohol concentrations of 0.24 and 0.18 g/dL [not 0.24 and 0.18 mg/dL] for pedestrian and hypothermia deaths, respectively)." On page 1346 in the "Results" section, the fourth and fifth sentences of the fourth paragraph should read as follows: "Of those tested, alcohol was present in 229 (91%) of the pedestrians, with a median blood alcohol concentration of 0.24 g/dL [not 0.24 mg/dL] (range, 0.10 to 0.71 g/dL) [not 0.10 to 0.71 mg/dL]. Similarly, alcohol was present in 120 (90%) of those who died of hypothermia and were tested, with a median blood alcohol concentration of 0.18 g/dL [not 0.18 mg/dL] (range, 0.03 to 0.56 g/dL) [not 0.03 to 0.56 mg/dL]."

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